

a_n ← power

$$2 \times 2 \times 2 \times 2 \times 2 =$$

$$3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3 =$$

$$(-5)(-5)(-5)(-5)(-5)=$$

$$a \times a \times a \times a \times a \times a \times a \dots \times a =$$

n times

exponent

base

$$(4^3)(4^7) = 4 \times 4 \times 4 \times 4 \times 4 \times 4 \times 4 \times 4 \times 4 = 4^{10}$$

$$(9^4)(9^5) = 9 \times 9 \times 9 \times 9 \times 9 \times 9 \times 9 \times 9 \times 9 = 9^9$$

$$a^n \times a^m = a^{n+m}$$

Apr 20-9:28 PM

$$a) (-5)^3 \times (-5)^2 = -5^{3+2} = -5^5$$

b) $34^7 \times 34^{60} = 34^{7+60}$
 $= 34^{67}$

$$5^2 \times 5^{-4} = 5^{-2}$$

$$-2^3 = -(2 \times 2 \times 2) = -8$$

$$(-2)^3 = (-2)(-2)(-2) = -8$$

$$-5^2 = -(5 \times 5) = -25$$

$$(-5)^2 = (-5)(-5) = 25$$

Very important when you have neg. base and even exponent

Apr 20-9:28 PM

Dividing Powers with the same Base:

Simplify $\frac{3^7}{3^5} \rightarrow = 3^7 \div 3^5 \rightarrow = 3^2$

State a rule for dividing powers with the same base:

$$\Rightarrow \frac{a^n}{a^m} = a^{n-m}$$

Ex 1: Simplify

a) $\frac{107^{23}}{107^{10}} = 107^{23-10} = 107^{13}$

b) $\frac{5^{50}}{5^{20}} = 5^{50-20} = 5^{30}$

c) $\frac{(-3)^7}{(-3)^5} = (-3)^2$

d) $\frac{200^{300}}{200^{299}} = 200^{300-299} = 200$

$\frac{30^5}{30^5} = 30^{5-5} = 30^0 = 1$

$\frac{30^5}{30^5} = \frac{30 \times 30 \times 30 \times 30 \times 30}{30 \times 30 \times 30 \times 30 \times 30} = 1$

$\frac{4^2}{3^4}$

$\frac{16}{27}$

Apr 23-12:20 PM

Power of a Power

Simplify: $(7^3)^2 = 7^6$

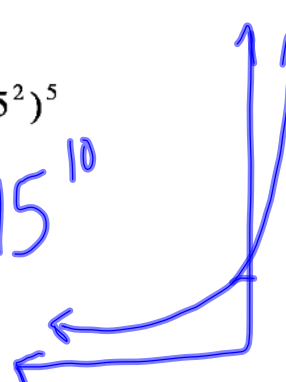
State a rule for power of a power:

$$\Rightarrow (a^n)^m = a^{n \times m}$$

Ex 1: Simplify

a) $(3^2)^4 = 3^8$

b) $(15^2)^5 = 15^{10}$



Apr 23-12:38 PM

Connecting the laws of exponents:

Power Of
a Product

(notice bases are different)

Power of
a Quotient

(notice bases are different)

exponent goes to each part of the base

ie:

$$(xy)^3 = (x^3)(y^3)$$

$$\left(\frac{x}{y}\right)^3 = \frac{x^3}{y^3}$$

$$\left(\frac{1}{4}\right)^2 = \frac{1}{16}$$

Apr 23-12:38 PM

Putting the Exponents Laws together

Simplify:

$$\begin{aligned} \text{a) } 5(5^3) \div 5^3 &= 5^4 \div 5^3 \\ &= 5^{4-3} \\ &= 5 \end{aligned}$$

$$\begin{aligned} \text{c) } \frac{(8^4)^5}{8^2(8^6)} &= \frac{8^{20}}{8^8} \\ &= 8^{12} \end{aligned}$$

$$\begin{aligned} \text{e) } \left(\frac{4}{9}\right)^7 \left(\frac{4}{9}\right)^3 \div \left(\frac{4}{9}\right)^7 &= \left(\frac{4}{9}\right)^{10} \div \left(\frac{4}{9}\right)^7 \\ &= \left(\frac{4}{9}\right)^3 \\ &= \frac{4^3}{9^3} \end{aligned}$$

$$\begin{aligned} \text{b) } \frac{(6^8)(6^3)}{6^7} &= \frac{6^{11}}{6^7} \\ &= 6^{11-7} \\ &= 6^4 \end{aligned}$$

$$\begin{aligned} \text{d) } \left(\frac{9(9^6)}{9^3}\right)^5 &= \left(\frac{9^7}{9^3}\right)^5 = (9^4)^5 \\ &= 9^{20} \end{aligned}$$

$$\begin{aligned} \text{f) } \left(\frac{2}{7}\right)\left(\frac{2}{7}\right)^5 &= \left(\frac{2}{7}\right)^1 \left(\frac{2}{7}\right)^5 \\ &= \left(\frac{2}{7}\right)^6 \\ &= \frac{2^6}{7^6} \end{aligned}$$

May 8-10:40 AM

Ex 2: Simplify

a) $(y(y^3))^4$

$$= (y^4)^4$$

$$= y^{16}$$

b) $\frac{c(c^{12})c^5}{c^6}$

$$= \frac{c^{18}}{c^6}$$

$$= c^{12}$$

Ex 3 Now think about this one...

$$(-6)^3 \times 6^4 =$$

Bases are
not the
same

$$= [(-1)(6)]^3 \times (6)^4$$

$$= (-1)^3 (6)^3 (6)^4$$

$$= (-1)^3 (6)^7$$

$$= -6^7$$

Apr 23-6:29 PM

Changing the BaseEx 1: Write each power with the following base:

a) base of 2

$$(4)^7$$

$$= (2^2)^7$$

$$= 2^{14}$$

b) base of 3

$$(9)^4$$

$$= (3^2)^4$$

$$= 3^8$$

c) base 3

$$(27)^5$$

$$= (3^3)^5$$

$$= 3^{15}$$

d) base of $\frac{1}{5}$

$$\left(\frac{1}{25}\right)^4$$

$$\left(\frac{1}{5^2}\right)^4$$

$$= \left(\frac{1}{5}\right)^8$$

Ex 2: Simplify using the exponent laws

$$\frac{27^5}{9^4} = \frac{(3^3)^5}{(3^2)^4}$$

$$\rightarrow \frac{3^{15}}{3^8}$$

(Assigned Work)

P 399 # 1-3 (d), 5, 7-9(cd),
10, 11d, 13, 14

$$\rightarrow 3^7$$

Apr 23-6:29 PM